

# The JNEM Arch's Unique Tram System Still Running After 30 Years

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**T**he highlight of a visit to Jefferson National Expansion Memorial (JNEM) is a ride to the top of the 630' Gateway Arch for a panoramic view of the surrounding area. This ride is in the form of a special transportation system, a unique combination of train, elevator and amusement park ride. From the very inception of the Arch in 1947, architect Eero Saarinen envisioned a "sky ride" to take visitors to the top of the Arch. Saarinen felt that one way to interpret the memorial would be to allow visitors to see the downtown area of St. Louis, the mighty Mississippi River, and the land stretching to the West. In a 1948 description of his plans, Saarinen imagined a family at the top of the Arch, seeing "the great plains beyond the city... [and] the great droves of people who landed here and passed under your very feet on their way to open up the West." But Saarinen had no idea how to get people up the inside of his curving structure. Technology and creativity would have to be used to solve the problem.

As plans for the Arch were revised in 1957 and money became available for its construction, the Saarinen firm began to search for an elevator company to create a "sky ride." None of the major firms would touch the project, however, fearful that in any system so unique a breakdown or accident would generate lawsuits and unfavorable publicity. Then, in early 1960, a man named Dick Bowser stopped to visit a friend at the Montgomery Elevator Company offices in Moline, Illinois.

Bowser had worked at many jobs over the years, including an apprenticeship to his father, who was an elevator man. Bowser left the University of Maryland without obtaining a degree in 1942 and enlisted in the Navy, serving on a destroyer in the Pacific. After the war, Bowser invented, manufactured and installed parking garage elevators which could travel horizontally and diagonally through a structure, eliminating ramps and driveways. Bowser's friend at Montgomery Elevator told him about Saarinen's "transporter" project for the Gateway Arch, and had his secretary call Saarinen's office. "By the time he handed the telephone to me, recalled Bowser, "there were two of Saarinen's partners on

the line. Their first question was, 'did an elevator have to travel vertically?' I said I didn't think so. I could remember that my father built and installed a dumbwaiter that transferred from one hatchway to another about half way up its vertical travel ... Their next question was, 'when can you meet with Eero Saarinen?'"

A month after their initial meeting, Saarinen called and requested a presentation from Bowser, as an independent contractor, for a workable Arch transportation system. The catch was what Bowser had to come up with a concept within two weeks. Bowser recalled that "The first drawing that I got had an outline of the Arch, and down at the bottom was a square that said 'elevator'—that's all there was." Bowser sketched, computed and dreamed day and night for the next two weeks to complete his plans, at home in his basement. Bowser recalled that his criteria included a National Park Service estimated passenger volume of 3,500 people in an 8-hour day, or up to 11,000 people in a 14-hour day. Although Saarinen forbade any distortion of the exterior of the Arch, Bowser had a free hand on the inside.

Bowser first looked at elevators. But getting people to the top of a 63-story catenary curve would require more than an ordinary elevator. The Arch is a triangle in cross section, and the different slopes of its curve limited a standard elevator to only the first 300 feet. Above that level, a smaller elevator which could travel at a steeper angle would be required. Between the larger and smaller elevators would have to be machine rooms, pits, and waiting spaces which would have consumed about six stories of the interior of the Arch. Bowser rejected standard elevators early in his two-week search for a solution.

Next he turned to escalators but, once again, many units would have been needed, and the cost would have been very high. Additionally, in the upper sections of the Arch the slope of an escalator would not have followed the required curvature. Bowser next considered a Ferris wheel principle. He recalled that "this involved utilizing small containers of people, with their seats pivoted to swing at any angle. This approach involved a continuous chain pulling seats which would go up one leg of the Arch and come down the other; but the distance... would have been almost half a mile, too

long for any chains or cables to negotiate successfully. The Ferris wheel system would also have had to move on the center line of the Arch, and no provision could be made for passengers to get off at the top observation area. Finally, a combination of the elevator principle and the Ferris wheel principle was developed into a train of capsules.” Designing capsules small enough to fit in the cramped upper levels of the Arch was the key to solving the problem of space.

After two weeks, Dick Bowser traveled to the offices of Eero Saarinen Associates in Michigan for a 45-minute presentation. Bowser expected a preliminary meeting with the architect and his staff, but instead walked into a room filled with St. Louis area congressmen, the mayor of St. Louis, construction engineers, and Director of the National Park Service George B. Hartzog, Jr. Bowser made a 40-minute pitch of his ideas for the trams, then endured several hours of relentless questioning. He refused to be intimidated by the group, even though he was an independent contractor with a college degree. His straightforward and simple style won over the group, who realized that his unique solution to the problem was the only practical plan they had seen.

Within a few weeks Bowser had a contract, for a fee of \$40,000, for a two-year job; as it turned out, the job lasted six years, until 1967, and Bowser stayed on with the Park Service maintenance staff at the Arch until 1972. Bowser’s original scheme was altered very little from the idea he conceived during a two-week period in 1960. The eight small capsules, used in each of the two Arch trains, “are similar to the barrels used in cement mixers,” according to Bowser.

“Each train capsule has a 5' diameter barrel.... The back has a center pivot shaft, and surrounding the open front there is a frame with rollers. The barrel can rotate within the frame, which is supported by wheels running in channel-shaped tracks.

“There are 5 seats in each capsule, so the weight of the passengers helps keep it in an upright position. Each capsule rotates approximately 155 degrees during the trip to the top of the Arch. When the capsule starts out in the load zone, the tracks are overhead, but as it goes up the Arch they come to be beneath the capsule. All

the way along, the framework rotates around the capsule. A separate train runs in each leg of the Arch because there is great deal of difference in the amount of time that loading takes at the top, where it is cramped, and at the bottom, where there is a great deal of room. Each train of eight capsules is powered by a typical heavy-duty elevator machine with cables, counterweights and all of the safety features of a modern high-speed passenger elevator. Each of the Arch trains carries 40 passengers and is capable of making a round trip in 9 minutes—including loading and unloading passengers in both directions. When running near capacity each train typically carries 200 to 225 passengers per hour.”

The trams have been operating for 30 years, traveling a total of approximately 300,000 miles and carrying over 27 million passengers. The final car design was by Planet Corporation of Lansing, Michigan, and they were built by General Steel Industries Inc. St. Louis Car Division, from Reynolds aluminum supplied by Joseph T. Ryerson & Son. The five fiberglass seats in each capsule are the only components of the cars and carrier frames not made of aluminum; they were designed by Eero Saarinen.

The trams were considered to be a transportation system, and found financing for construction and day-to-day operations from the Bi-State Development Agency, a local corporation licensed to run mass transportation in the St. Louis area. The unique partnership between Bi-State and the NPS at the Arch has allowed the dreams of Eero Saarinen and Dick Bowser to become a reality. A maintenance crew, dedicated to the Arch tram system, comprise some of the most specialized people in the NPS, with a history of innovative solutions to their credit. Their mission is to keep the trams running, and the service record of the system is a testament to their effectiveness. The Arch trams are a premier example of the uses of technology in interpretation. The Arch tram system created by Dick Bowser is as unique and special as the Arch itself, and is one of the many amazing aspects of Jefferson National Expansion Memorial.

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*Bob Moore is a historian at Jefferson National Expansion Memorial, St. Louis, Missouri.*